

G e a r a n d B e h a v i o u r C o m m i t t e e

By A.R. MARGETTS

1968

Belgium

(P. Hovart)

The following projects were undertaken:-

1. Selectivity experiments with shrimp nets.
2. Selectivity studies on cod and whiting.
3. Study of the water currents in a shrimp net.
4. Comparative studies on the drag between nets with different taper ratios.
5. Standardization of net materials and netting.
6. International collaboration with the ISO Working Groups for standardization of tests on netting yarns and netting.

Canada

(F.D. McCracken)

Trawl Engineering

An engineering study of the otter trawl continues to be the major project. During 1968, various refinements in instrument design and experimental technique have been achieved. These include modifications to the FRB/NRC underwater warp angle meters, more accurate radar course plots, and calibration of all tension meter instruments by dead-weight pressure reference in place of the bourdon-tube test gauge. Basic engineering data on additional trawl types were obtained, using the R.V.A.T. "Cameron". The Yankee 41-5 trawl was studied further to make a comparison between den leno gear and wing-bridle rig and to establish the effect of ground warp (cable) length. A Granton trawl was studied for the first time.

Computer programmes are being developed for primary reduction of the trawl engineering data. An outside firm has been contracted to assist with specific aspects of the engineering analysis of the trawl behaviour.

Fish Behaviour

Auditory masking was studied in cod in a specially constructed aquarium tank. Five half-octave bands of noise were used as signal stimuli and as masking stimuli. Results showed masking to be more pronounced when noise and signal coincided in frequency. Masking was calculated in terms of threshold re-masking noise level and varied from about 11 db when signal and noise were at the same frequencies to about -19 db when they were four octaves removed from each other. These results are to be used in an analysis of ocean ambient and gear noises to describe how fishing gear becomes audible to fish.

Denmark

(K.P. Andersen)

No research work within the scope of this Committee was carried out in 1968.

France
(G. Kurc)

Technologie des chaluts

Des études, comportant le dessin des plans à l'échelle, ont été réalisées pour des chaluts de types divers, notamment: chaluts de fond à grande ouverture verticale (bateaux de 150 à 1,000 CV), chaluts à crevette à panneaux ou à perche, chaluts à langoustine, chaluts semi-pélagiques au maquereau, chaluts pélagiques au harengs et à la morue pour chalutiers jusqu'à 2,000 CV, chaluts-boeufs pélagiques au hareng (dont certaines versions à mailles de 500 mm étirées dans la partie antérieure du filet).

Les essais en mer de certains de ces engins ont été suivis à bord de chalutiers commerciaux. A ce sujet on peut signaler en particulier les bons rendements obtenus au Grønland en juin par le chalutier de grande pêche "Joseph Duhamel" avec un chalut pélagique à morue; ceci vient confirmer les résultats des essais effectués en 1965 à bord du chalutier "Vilie-de-Fécamp" dans la région du Labrador.

Au cours d'embarquements sur des chalutiers harenguiers pêchant au chalut semi-pélagique en Mer du Nord, des données ont été recueillies à la fois sur le fonctionnement du filet et sur l'utilisation du sonar pour ce genre de pêche.

Etudes sur maquettes

Les travaux réalisés dans le bassin d'expérimentation de Boulogne ont porté principalement sur la mise au point de différents types de chaluts et de gréements.

Au moyen d'une balance hydrodynamique des mesures ont été faites sur les forces de traînée et poussée qui s'exercent sur les panneaux divergents; une comparaison des panneaux rectangulaires et ovales a été notamment réalisée sur des maquettes au 1/10.

Sélectivité

Les travaux effectués d'une part sur maquettes en bassin et d'autre part en mer, à bord de la "Thalassa", ont permis de préciser l'influence du type de dispositif de sélectivité, ainsi que celle du mode passage de l'eau dans la poche, conditionnée par la forme du corps et de la poche du filet.

Pêche à l'électricité

Une opération originale dont l'étude a trouvé la conclusion théorique en 1968 est celle qui se propose une application de l'électricité à la pêche des espèces pélagiques telles que sardines, anchois, sprats, maquereaux, harengs etc. Commencée depuis plusieurs années, cette étude pour laquelle il a fallu faire appel à la coopération d'organismes spécialisés dans l'électronique, conduit à envisager la fabrication prochaine d'un alternateur impulsif d'un type nouveau qui doit permettre l'attraction et la capture des pélagiques en eau de mer. La capture se fera à l'aide d'électrodes étudiées à l'Institut des Pêches Maritimes et dont l'une sera confondue avec une pompe qui aspirera le poisson. Le prototype de cet appareil sera monté sur un bateau dont les spécifications sont à l'étude.

Germany
(A. von Brandt)

Fishing Gear Investigation

The investigations with midwater trawls have reached some final state. The tests have been concentrated on the improvement of known types by larger meshes in the fore part of the trawls. Meshes with an opening of 800 mm have been used. By this the net opening could be increased to ca. 45 x 50 m. The "netsonde" has been replaced also in the commercial fishery by a "multinetsonde", to have a better knowledge of gear behaviour and the behaviour of fish in front

of the net opening. It has been shown that midwater trawls could also be used successfully by the commercial fleet for catching redfish. First steps have been made to measure temperature at the gear during trawling.

Selectivity Experiments

In 1968 selectivity experiments with trawls were continued in northern areas. Near Bear Island selectivity results for cod were similar to those obtained with cod-ends of the same material some years ago off the west coast of Greenland. This contrasts with previous Bear Island data and may be due to changes in the feeding conditions (better because of higher fishing mortality) in the north-east area. It was confirmed that netting twines made of polypropylene, no matter which type of fibre formation, fall into the same selectivity group as manila and sisal. Moreover, it has been found once more that netting twine of polyethylene fibres should not be included in either the polyamide or in the manila/polypropylene selectivity groups.

Net Materials

Net materials used for trawls have not changed in comparison with 1967. Mostly polyamide fibres have been used for trawls including cod-ends. Small quantities of polyethylene fibres are also used for cod-ends. For side trawlers some parts of the underbelly and under-wings are made of polypropylene split fibre.

The national discussions of standards for net materials and netting have, in concert with international discussions, been on testing of net materials, cutting of netting, drawings for netting and definition of the weight of netting.

Fish Behaviour

As far as deep-sea fisheries are concerned, the investigations on fish behaviour have been concentrated on herring of Georges Bank. Good catches are not the result of lazy behaviour of the herring schools in reaction to the trawl, but depend mostly on the density of fish concentrations. Small schools could avoid the midwater trawls, as is known for other areas; in larger schools the fish hampered each other and big catches have been possible. It had been surmised that the stocks on Georges Bank might be more vulnerable since they have had no previous experience of pelagic trawling, but fish reactions to the gear scarcely differed from those of other intensively fished stocks. New investigations on fish reactions in relation to noises caused by vessels were started in 1968.

Iceland

(G. Thorsteinsson)

Fishing Gear Investigations

An experiment was made with a new kind of a herring purse-seine. This purse-seine differs from the purse-seines commonly used in Iceland in the following details:-

- (a) the hanging ratio was 30-35%, whereas the commercial purse-seines are hung in at about 45%.
- (b) the hanging coefficient of the leadline was altered less, since the leadline is commercially hung in much less than the floating line. Thus the leadline was relatively shorter than before.
- (c) a second leadline was added to the seine about 20 fm above the usual one. The aim of this leadline was to close the seine better during the pursing. Bathykymograph measurements showed that the sinking speed remained the same, whereas the seine closed much better during the pursing, thus increasing the catch possibilities. No operation difficulties arose and the catches were satisfactory.

Selectivity

Selection experiments with prawn trawls were continued.

Material

A material testing service was established.

Netherlands

(J.G. de Wit)

The influence of the trawl on herring spawning sites and the damage done by the trawl have been studied. However, it proved to be rather difficult to localize the egg-beds on the Whitby Ground. The work will be continued in the next year.

Preliminary work was done in the field of electrical fishing to improve the tickler chains for shrimp and sole fisheries. The work was started in the last month of the year. Results for shrimp fishing seem to be favourable.

Tank studies on the diurnal activity of several species of flatfish proceeded and will be continued in the next year.

Full-scale resistance measurements have been carried out with a beam trawl. Both the water resistance and the combined water and bottom resistance have been measured without tickler chains and with up to six tickler chains.

Extensive studies and measurements are in progress on the relationship between the propulsive engine output and the capacity of the winch (mainly pull and hauling speed). The introduction of electric and high pressure hydraulic winches with remote control has been promoted.

Experiments to get rid of mud, shells, Ulva, hydroid polyps, etc. in front of the sieving panel of a shrimp trawl have been started.

The introduction of pair-trawling has been promoted with vessels of about 45 m in length having a propulsion machinery of 1200 hp and using pair-trawls of 1400 meshes of 40 cm mesh length in the front part of the net. The introduction of net drums for pair trawling has been started.

Experiments with a pair-trawl of 444 meshes of 40 cm mesh length for use on board a single trawler of length about 23 m, engine output 280 hp, resulted in a 10 x 10 m net opening measured by a net sounder.

The shrimp sieve separating undersized shrimps and flatfish from consumable shrimps and flatfish and bringing the undersized ones back into the sea again proved to offer very good survival possibilities to the small shrimps and flatfish.

Work on standardization of fishing nets continued in co-operation with ISO Testing of netting yarns and netting has been studied in an ISO Working Group. This work is still going on.

Yarns for net making were 100% polyamide.

The research vessel "Tridens" entered service on 1st May 1968.

Efforts to revive Dutch seine fishing for plaice have been promoted with, so far, moderate success.

Efforts in purse-seining proved to be unsuccessful from an economic point of view.

Norway

(L. Midttun)

Gear

Design and construction of a new research vessel has been continued. Being a tool and platform for future experiments and field work in fisheries research, including gear and behaviour studies, the design of this vessel has been regarded as a task of great importance. The ship will be arranged for all sorts of fishing operations, and equipped with the most modern instruments, including a computer for data logging, processing and presentation.

Some experiments with midwater trawling have been carried out.

Studies have been undertaken on the catching ability of a long line with different hook design.

Behaviour

A field station has been established for experiments on the reaction of fish to noise. Studies have been started on hearing direction of fish.

A working group was established to analyse the importance of noise in the effectiveness of fishing operations.

Some studies have been made on the effect of light on behaviour of capelin.

Important changes in the migration and behaviour pattern of Atlanto-Scandian herring have been observed.

Acoustics

Work on improvement of acoustic methods for absolute abundance estimation has been continued. Further studies have been carried out on the possibility of acoustic identification.

Poland

(W. Cieglewicz)

Fishing Gear

The work on standardization of fishing gear for 17 and 24 m cutters was carried out (comparative analysis of gear construction, technical and fishing experiments at sea). The studies on pelagic trawls for side and stern trawlers were continued. New types of bottom trawls, two-seamed and multi-seamed, have been designed for vessels already operating and for newly built vessels.

Automatic, self-recording instruments of original design have been produced for studies on trawl performance. These include deck and underwater dynamographs of various ranges of measurements, bathygraphs, differential bathygraphs for measuring the vertical gap of trawl opening, and instruments for measuring horizontal spreads in the trawl by mechanical and hydro-acoustic methods.

Fish Behaviour

The studies on reaction of fish to electric field in the Baltic Sea and the North Sea were continued.

Some trials were conducted to attract fish into concentrations by means of electric lamps brought under water.

Net Materials

The studies on the usefulness of polypropylene and polyamide "Steelon" (raschel netting materials) for construction of drift-nets were continued. Two standards dealing with the estimation of the quality of net materials were introduced.

Sweden

(G. Otterlind)

Experiments on a small scale have been done in the Baltic with one-boat pelagic trawl. In commercial fisheries (mainly in the North Sea) the trend with larger two-boat pelagic trawls, having very large meshes in the anterior part, has continued; the largest mesh size reported was 80 cm.

In bottom trawls for demersal fish the cod-end material is now practically exclusively plaited nylon.

United Kingdom

1. England & Wales

(A.R. Margetts)

Fishing Gear

In collaboration with Aberdeen Laboratory, the collected data from the series of comparative fishing experiments of the past five years have been examined and tested statistically in order to show what were the effects on bottom trawl catches of alterations in the arrangement and geometry of otter boards and bridles. Differences were noted in the quantities and size of fish caught and these are to be used in an interpretation of how a trawl works.

At sea, a first experiment was made to determine the effects of various tickler chain arrangements upon the shape of an otter trawl. Sonar and multi-direction echometer apparatus were used to study fish shoal movements in relation to a single boat pelagic otter trawl.

Co-operation was maintained with British Standards Institute and International Standards Organisation to establish standards for fishing nets.

Apparatus

Electronic sector-scanning sonar was installed in R.V. "Clione" and first sea trials carried out. First results were encouraging, but some mechanical noise from the stabilisation equipment is to be suppressed.

A system for automatic measurement of a trawler's fishing time, based on the use of the winch for shooting and hauling, was given very satisfactory sea trials.

Further improvements were made to fish echo-counting equipment. Humber and 100 kHz equipments were fitted with integrators and digital counters. Target strength measurements were made using a very high speed recorder while the ship was steaming.

An acoustic transducer array for determining numbers of fish in the path of a trawl was built but has yet to be tested at sea.

Behaviour

In the aquarium, experiments have been carried out using a flume to study the behaviour of plaice in relation to water currents. Other experiments have investigated tolerances and the responses of cod and perch to changes in hydrostatic pressure affecting the fish buoyancy.

Net Materials

A higher proportion than previously of English trawlers is now using polyethylene trawls.

2. Scotland

(R.Jones)

Fishing Gear

Comparative fishing experiments conducted on F.R.S. "Explorer" on the catching efficiency of different demersal trawls were continued in 1968, particular attention being given to effects of different otterboards (cambered and flat type) and twin sweeps compared with single sweeps. The tests undertaken on F.R.V. "Mara" using different otterboards ('V' type, cambered and flat) to obtain a variety of spreads in front of the net, showed that for flatfish, the catch rate was almost linearly dependent on otterboard spread. This result differs from that obtained with the larger nets on F.R.S. "Explorer", where the catch of flatfish was proportional to bridle length. Clearly, optimisation of the geometry of the rigging in front of the net, in addition to the net towing speed etc., is complex and the more recent hypotheses, including the effect of acceleration of the fishing gear caused through warp vibration, ship movement and type of sea bed, may play an even more significant part than was hitherto thought likely.

Observations on model trawls have continued in the tanks of the National Physical Laboratory and on the smaller research vessels. The results of direct observations, obtained by the use of divers, on trawl nets and several small purse-seine models, have been combined with theoretical work to improve the reliability of the basic equations that are currently being used in fishing gear design.

Apparatus

Attention has been given to improving the instrumentation and data collection techniques in fishing gear studies, and an acoustic telemeter capable of transmitting up to 16 channels of information from the net to the ship, has been developed and fully tested. Special attention has been given to the measurement of wire tensions, opening heights and opening spreads, at various parts of the net and bridle system. A further communication link, between the otterboard and the ship has also been developed. This uses a conducting core, replacing the heart of the standard ship's warp. The final product (an Elliott 920C fast digital computer) has been on board F.R.S. "Explorer" since early 1969. This will form the centre of the data logging system to be used on the ship.

Sonar work was mainly directed to the development of an automatic fish counting system, based on a high resolution acoustic system. As a secondary task the improvement and development of a solid state sector scanning sonar was undertaken.

Behaviour

The programme of fish behaviour studies was again centred on studies of underwater vision and visibility, and the reactions of fish to sound stimuli and sound production. Visibility studies concentrated on short-term variability of turbidity in Scottish waters and the influence of polarised analysers. These appear to affect the attenuation of contrast between object and observer more than the background. The relationship between these studies and practical fishing gear will be continued.

A technique of open water conditioning of fish to react to sounds by missing a heart beat allowed studies to be made of the sensitivity of cod to pure tone stimuli. Maximum sensitivity between 110 and 200 Hz appears to vary with sea state, indicating that the limitation was set by the signal to noise ratio rather than the absolute intensity of the sound.

Further work has been carried out on the sounds generated by fishing vessels, including a detailed analysis of the sound generated by a commercial purse-seiner. The relationship between this work and that to determine the sensitivity of fish to sounds of different frequencies will allow estimates to be made of the distance at which fish could sense the presence of the ship and/or gear.

U.S.S.R.

(S. Fedorov)

In 1968 investigations were continued to establish equivalent mesh sizes in trawls made of different materials. As a result, equivalents of mesh size in capron materials with respect to those of manila were specified.

Methods of comparative trawl tests in fishery conditions and methods and instruments for laboratory tests were developed for investigations of abrasion of net materials.

The design of a trawl for catching krill (Euphausia superba Dana) was improved and tested. Deep water trawls with complete rigging were worked out.

Studies in fish behaviour were made to establish fish reaction to different stimuli - light, sound, current etc. Peculiarities in fish schooling and schooling behaviour were investigated in tanks.

Visual observations on fish behaviour in natural conditions were carried out from the observation chamber "Sever-I" in July-August 1968 on board the R.V. "Tunets". Forty-five submergences were made at depths up to 260 m. Submergences were carried out while the ship was anchored or drifting. When the ship was moving at the speed of 0.5-1.0 miles per hour an investigator could observe everything out of five windows of the observation chamber - sea bottom, fish, invertebrates, algae.

Results of underwater investigations are given in papers which are included in the volume "All-Union Conference on Fish Behaviour in Relation to Fishing Techniques and Tactics", Murmansk, PINRO, 1968.

Ireland

(J. Hillis)

No gear or behaviour research to report.